

REMARKS/ARGUMENTS**I. Status of the Application**

A final Office Action was mailed on January 25, 2006. Applicants presently timely file this Preliminary Amendment together with a Request for Continued Examination and Petition for a Two-Month Extension of Time. Reconsideration of this application is respectfully requested.

Claims 1 - 6 are currently pending in this application. Claim 5 is canceled without prejudice or disclaimer, claim 1 is amended to include, inter alia, the limitations of canceled claim 5, and claim 6 is amended to depend from amended independent claim 1. No new matter is introduced. Support for the amendments may be found, for example, at page 9, line 21 through page 10, line 11 and page 12, lines 6 through page 14, line 6 of Applicants' specification.

II. Objected Claim

At paragraph 6 of the present Office Action, the Examiner indicates that claim 7 is objected to as depending on rejected base claim 1, but would be allowable if rewritten to include all of the limitations of base claim 1 and any intervening claims. As only claims 1 - 6 are presently pending, Applicants presume that the Examiner intended to make reference to pending claim 6, and thank the Examiner for providing this determination.

As elaborated upon below, Applicants amend independent claim 1 and submit that amended independent claim 1 is currently allowable. For at least this reason, Applicants submit that dependent claim 6 is also allowable, and respectfully request that the objection to claim 6 be withdrawn.

III. Rejections under 35 U.S.C. §§ 102, 103

Claim 1 is rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,823,962 to Iwasa et al. Claims 2 - 4 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwasa in view of U.S. Patent Publication No. 2003/0221896 to Sasaki et al. Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwasa in view of U.S. Patent No. 6,237,713 to Onodera et al. Applicants cancel claim 5, so that the rejection as to claim 5 is moot. Applicants

amend claim 1 to incorporate the limitations of canceled claim 5 and to further define the nature of their invention, and respectfully traverse these rejections.

(Claimed Invention Is Patentable Over the Cited Prior Art References)

In amended independent claim 1, Applicants claim:

1. A steering apparatus for a vehicle, comprising:

a steering shaft supported in a cylindrical housing so that the steering shaft can freely move in an axial direction; and

a nut member screwed onto a screw groove formed in an outer circumference of the steering shaft through a rolling member and rotatably supported in the housing,

wherein steering is performed by transmitting rotation of a motor, which is driven according to steering, to the nut member and converting rotation of the nut member into movement of the steering shaft,

the housing is constructed by coaxially connecting a first housing having an integrally formed fixing section for fastening to a vehicle body with a second housing having a fixing section for fastening to the vehicle body in a separate member,

the first housing connects a pinion housing for supporting a pinion shaft having a pinion for meshing with rack teeth of the steering shaft,

the nut member is supported by a thrust bearing fitted and fixed in the first housing so that the nut member cannot move in both directions along an axial direction,

a radial bearing is fitted and fixed in the second housing, wherein the nut member is respectively supported at two points along an axis of the nut member by the thrust bearing and the radial bearing,

the thrust bearing comprises a pair of angular ball bearings placed back to back, and

an axis line of the motor is inclined from an axis of the steering shaft toward an axis of the pinion shaft.

Iwasa discloses an electric power steering system having a first housing H2a coaxially connected to a second housing H2b, the second housing H2b including a nut member 6 supported by rolling bearings 13, 14 each at opposing ends of the nut member (see, e.g., FIG. 1 of Iwasa). The Examiner suggests that rolling bearings 13, 14 are equivalent to Applicants' claimed radial bearing

and thrust bearing, respectively. Claim 1 adds the limitation of former claim 5 requiring that the thrust bearing comprises a pair of angular ball bearings placed back to back. With reference to former claim 5, the Examiner suggests that the bearing 4 disclosed by Onadera meets the limitations of former claim 5.

At column 6, line 57 through column 7, line 10 and at column 7, lines 14 - 29, Iwasa describes the arrangement of bearings 13 and 14 as follows:

The rotary element 5 is fitted on an outer periphery of the rack shaft 3 via a gap therebetween. The rotary element 5 has its right end rotatably carried on the first housing H2a via a first rolling bearing 13 and its left end rotatably carried on the second housing H2b via a second rolling bearing 14. The rotary element 5 is formed with a step 5a at a portion rearward of the second bevel gear 4 such as to inhibit the second bevel gear 4 from moving away from the first bevel gear 2 (see FIG. 3).

The first rolling bearing 13 consists of a ball bearing, which serves to retain the rotary element 5 as allowing for the axial movement thereof. The second rolling bearing 14 also consists of a ball bearing, an inner ring of which is defined by the rotary element 5. An outer ring 14a of the second rolling bearing 14 and the second housing H2b are allowed for relative axial movement. Therefore, the rotary element 5 can be moved rightwardly by pushing a left side (outer lateral surface) of the outer ring 14a of the second rolling bearing 14 toward the first bevel gear 2, the rightward movement accompanied by the movement of the second bevel gear 4 toward the first bevel gear 2.

...

The biasing member 7 includes a coned disk spring which is interposed between the left side of the outer ring 14a of the second rolling bearing 14 and a spring seat (biasing member seat) 15 formed at place of the second housing H2b as opposing the left side of the outer ring via a gap S therebetween (see FIG. 3). The biasing member 7 is seated in the gap S as resiliently contracted by a predetermined amount thereby constantly biasing the second bevel gear 4 toward the first bevel gear 2 via the second rolling bearing 14 and the rotary element 5. Such an arrangement for biasing the second bevel gear 4 via the second rolling bearing 14 negates the need for an additional bearing for permitting relative rotation between the biasing member 7 and the rotary element 5.

Accordingly, as illustrated in FIG. 2 of Iwasa, the thrusting force exerted by rotary element (ball nut) 5 is confined by the second housing H2b (via biasing member 7 and bearing 14) and the first housing H2a (via bevel gear 2, support shaft 1, bearings 12 and housing H1). Alternatively, the thrusting force is confined by second housing H2b in which bearing 14 is fixed as

illustrated in FIG. 5 of Iwasa.. Similarly, in the electric power steering unit disclosed by Onodera, angular bearing 4 confines thrusting forces exerted by nut section 19 to a housing B, which is effectively equivalent to the Applicants' claimed second housing, which does not carry the thrust load producing pinion/steering assembly 5 (se, e.g., column 6, line 63 - column 7, line 3 and FIG. 1 of Onodera).

In sharp contrast to the apparatus disclosed by each of Iwasa and Onodera, Applicants' amended independent claim 1 claims a steering apparatus in which "the nut member is supported by a thrust bearing fitted and fixed in the first housing so that the nut member cannot move in both directions along an axial direction" (emphasis added). As a result, and in contrast to the apparatus disclosed by Iwasa and Onodera, Applicants claimed apparatus confines the thrusting forces associated with the pinion/steering assembly and the nut member to just one of the two coaxially connected housings (the first housing). As further described in Applicants' specification, for example, at page 13, line 23 through page 14, line 6, Applicants' inventive apparatus enables a more favorable design approach to be taken with the second housing:

Here, the first housing 21 is firmly fixed to the vehicle body with the integrally formed fixing bracket 23, and the thrust loads carried by the thrust bearing 54 are sufficiently carried by the first housing 21 and are not transmitted to the second housing 22. It is therefore possible to decrease the thickness of both of the connection flanges 25 and 26 in the connection section of the first housing 21 and second housing 22, reduce the size and number of the fixing bolts 27, 27 ... for connection, increase the freedom in design, and achieve a reduction in the weight of the product.

(Emphasis added)

In addition, by eliminating the thrusting force on the second housing, Applicants apparatus is able to incorporate a movable bracket 24 on the second housing 24 for more easily fastening the second housing to the vehicle body (see, e.g., page 8, line 25 through page 9, line 11 of Applicants' specification. Unlike Applicants' claimed invention, neither Iwasa nor Onodera disclose or suggest a steering apparatus in which thrusting forces are confined to be exerted on only one of two coaxial housings that house a steering shaft, thereby enabling the size and weight of the other housing to be reduced over conventional designs.

CONCLUSION

Therefore, in view of the above amendments and remarks, it is respectfully requested that a Notice of Allowance as to all pending claims be issued in this case.

No fee is believed to be due with this submission. If, however, any fee is due, the Commissioner is authorized to charge up to \$300.00 on Deposit Account No. 04-0100.

If there are any other issues remaining which the Examiner believes could be resolved through either an additional Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at the telephone number indicated below.

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Respectfully submitted,

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